UNITED STATES PATENT AND TRADEMARK OFFICE

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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

    A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒   Responsive to communication(s) filed on _12 May 2003_ .

2a)☒   This action is **FINAL**.   2b)☐ This action is non-final.

3)☐   Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
        closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒   Claim(s) _2,3,5-11,13-17,19-25 and 27-35_ is/are pending in the application.

        4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐   Claim(s) _____ is/are allowed.

6)☒   Claim(s) _2,3,5-11,13-17,19-25 and 27-35_ is/are rejected.

7)☐   Claim(s) _____ is/are objected to.

8)☐   Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐   The specification is objected to by the Examiner.

10)☐   The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

        Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐   The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

        If approved, corrected drawings are required in reply to this Office action.

12)☐   The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐   Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

        a)☐ All b)☐ Some * c)☐ None of:

            1.☐ Certified copies of the priority documents have been received.

            2.☐ Certified copies of the priority documents have been received in Application No. _____ .

            3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
               application from the International Bureau (PCT Rule 17.2(a)).

        * See the attached detailed Office action for a list of the certified copies not received.

14)☐   Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

        a) ☐ The translation of the foreign language provisional application has been received.

15)☐   Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)   4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)   5) ☐ Notice of Informal Patent Application (PTO-152)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _6_ .   6) ☐ Other: .

DETAILED ACTION

1.   This communication is responsive to Amendment B, filed 5/12/03.

2.   Claims 2-3, 5-11, 13-17, 19-25, and 27-35 are pending in this application. Claims 1, 4,

12, 18, and 26 are canceled. This action is made final.

Claim Objections

3.   Claims 19-20 are objected to because of the following informalities: Claims 19-20

should depend on claim 35. Appropriate correction is required.

Claim Rejections - 35 USC § 101

4.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or
> any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and
> requirements of this title.

5.   Claims, 2-3, 5-7, 15-17, 21, 27-28, 31-32, and 34 are rejected under 35 U.S.C. 101

because the claimed invention is directed to non-statutory subject matter.

Claims 2-3, 5-7, and 31-32 clearly recite a method for calculating the

approximation of a natural logarithm function according to a mathematic algorithm.

Claims 15-17, 21, 27-28, and 34 recite an apparatus implementing the above process but

fail to limit the apparatus to any particular structure other than a general computer with

input, memory, and processing devices. Indeed, any apparatus used to implementing the

underlined process would result in an apparatus as claimed. In order for such a claimed

method, computer-related process, or a claimed non-specified apparatus implementing

the underlined process to be statutory, the claims must include either a step or means that

results in a physical transformation outside the computer or a limitation to a practical

application. However, it is clear from the claims that the claims merely recite step or

non-specific means for data computation and manipulation in performing a mathematical

function. The input is a number and output is also a number. The claims fail to recite

any step or means that results in a physical transformation outside the computer, that

includes a limitation to a practical application, or that requires a specific computer to

implement the claimed process. Therefore, claims 2-3, 5-7, 15-17, 21, 27-28, 31-32, and

34 are clearly directed to a non-statutory subject matter

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

7.   Claims 2-3, 7, 15-17, 21, and 31 are rejected under 35 U.S.C. 103(a) as being obvious

over Smith (U.S. 5,570,310) in view of Watson (U.S. 5,629,780).

Re claims 15 and 31, Smith discloses a method in Figure 3 for computing

(equation 10) for a natural logarithm function. The method comprises the following

steps: partitioning of mantissa (col. 3 lines 65-67 and col. 4 lines 1-5 where i is the index

of that sub-region as described in equation 13) between 1 and 2 into N equally spaced

sub-regions, precomputing ai (col. 4 lines 17-18) of each of N equally spaced sub-regions

where i = 0 to N-1, selecting N sufficiently large (col. 4 lines 1-10) so that the first degree

polynomial in computation of log(m) within a preselected degree of accuracy, and

computing (abstract) a value of log(x) for binary floating point representation of a

particular number x stored in a memory of a computing device. Smith does not disclose

the precomputing point ai is the centerpoint of each of the sub-region. Smith does not

discloses the computation of approximation of log(x) using first degree polynomial in m.

However, Watson discloses a method of determining a value using a mid-point within a

region for minimizing the error (col. 10 lines 30-35). In addition, it is well known in the

art to use Taylor series to approximate a value. In order to minimize the computation

process, the approximation of log(m) using Taylor series is utilizing the first degree

polynomial of the Taylor series. Therefore, it would have been obvious to a person

having ordinary skill in the art to use first order Taylor series to approximate the log(m)

function and using the mid-point ai as the preference point because it would reduce the

computation time and the region error.

Re claims 2-3, 7, 16-17, and 21, Smith discloses the method in Figure 3 for

computing a natural logarithm function wherein the input number x (col. 1 lines 58-65)

has a binary exponent in addition to the binary mantissa m. Smith discloses the steps of

computing a value of log(x) by partitioning a mantissa m of binary representation of x in

a memory (220 and 260) and precomputed value of log(ai) (280). Smith does not directly

disclose that the Δx is computed from mantissa m to reference mid-point ai and the

computation of log(x) using a polynomial of first degree in m. However, Watson

discloses a method of determining a value using a mid-point within a region for

minimizing error (col. 10 lines 30-35). In addition, it is well known in the art to use

Taylor series to approximate a value. The equation in claim 3 is the first order

approximation of log(m) using Taylor series where $\log(m) = \log(ai) + \Delta x/ai$. Therefore,

it would have been obvious to a person having ordinary skill in the art to use first order

Taylor series to approximate the log(m) function and using the mid-point ai as the

preference point because it would reduce the computation time and the region error.

8.   Claims 8-9, 22-23, and 29-30 are rejected under 35 U.S.C. 103(a) as being obvious over

Smith (U.S. 5,570,310) in view of Wallschlaeger (U.S. 5,345,381).

        Re claims 8-9, 22-23, and 29-30, Smith discloses the above method for computing

a natural logarithm function. Smith does not disclose that method can be utilized in a

computed tomography scanner as in image reconstructor for generating an image of an

object from acquired projection data of the object. However, Wallschlaeger discloses the

use of logarithm function (col. 1 lines 35-40) in a computed tomography scanner (Figure

1) as in image reconstructor (col. 1 lines 25-35) for generating an image of an object by

manipulating the intensity values (Figure 3). Therefore, it would have been obvious

application o a person having ordinary skill in the art to use the method of logarithm

function in tomography scanner as in image reconstructor for generating an image of an

scanned object because the Smith's logarithm function method would yield faster results

and less error.

9.   Claims 10-11 and 24-25 are rejected under 35 U.S.C. 103(a) as being obvious over Smith

(U.S. 5,570,310) in view of Wallschlaeger (U.S. 5,345,381); as applied above, in further view of

Watson (U.S. 5,629,780).

        Re claims 10-11 and 24-25, Smith in view of Wallschlaeger discloses the method

in for computing a natural logarithm function in tomography scanner wherein the input

number x (col. 1 lines 58-65) has a binary exponent in addition to the binary mantissa m.

Smith in view of Wallschlaeger discloses the steps of computing a value of log(x) by

partitioning a mantissa m of binary representation of x in a memory (220 and 260) and

precomputed value of log(ai) (280). Smith in view of Wallschlaeger does not directly

disclose that the Δx is computed from mantissa m to reference mid-point ai and the

computation of log(x) using a polynomial of first degree in m. However, Watson

discloses a method of determining a value using a mid-point within a region for

minimizing error (col. 10 lines 30-35). In addition, it is well known in the art to use

Taylor series to approximate a value. The equation in claim 3 is the first order

approximation of log(m) using Taylor series. Therefore, it would have been obvious to a

person having ordinary skill in the art to use first order Taylor series to approximate the

log(m) function and using the mid-point ai as the preference point because it would

reduce the computation time and the region error.

Allowable Subject Matter

10.   Claims 13-14, 19-20, 33, and 35 are objected to as being dependent upon a rejected base

claim, but would be allowable if rewritten in independent form including all of the limitations of

the base claim and any intervening claims.

Response to Arguments

11.   Applicant's arguments filed 5/12/03 have been fully considered but they are not

persuasive.

a.   The applicant argues in page 7 1st paragraph that the rejection under 101 is invalid

because there is at least one credible utility in the specification or the claims.

The examiner respectfully submits that the rejection under 101 above is clearly

recited the reason of rejecting **claims** 2-3, 5-7, 15-17, 21, 27-28, 31-32, and 34.

Based on the claimed language, these claims only purely recite the approximation

of a natural logarithm function according to a mathematical algorithm.

b.   The applicant argues in page 9 2nd paragraph for claims 15 and 31 that the

obviousness cannot be established by combining Smith'reference and Watson's

reference.

The examiner respectfully submits that mid-point interpolation in a region is a

well-known method in mathematic. For instant, the Watson's reference and

Yang' reference (U.S. 5,886,911) clearly recite a mid-point computation wherein

Watson's reference discloses (col. 10 lines 30-35) a mid-point computation in a

region for minimizing error and converging faster. Therefore, it is obvious to a

person having ordinary skill in the art at the time the invention is made to

combine Smith's reference and Watson's reference for approximating a log(x)

along mid-point regional computation.

c.   The applicant argues in pages 10-11 that neither Smith nor Watson, considered

alone or in combination, discloses a method in claims 15 and 31.

The examiner respectfully submits that Smith in view of Watson clearly disclose

the method in claims 15 and 31 as cited in the 103 rejection above. Smith

discloses all the limitations except the mid-point regional computation. However,

in view of Watson, Watson discloses the mid-point regional computation for

minimizing error and converging faster. Therefore, Smith in view of Watson

disclose a method in claims 15 and 31.

d.   The applicant argues in pages 11-15 for claim 15 that Smith nor Watson,

considered alone or in combination, discloses a method in claim 15.

The examiner respectfully submits that claim 15 is a computer device claim of

claim 31. Thus, claim 15 is also rejected under the same rationale in the rejection

of rejected claim 31.

e.   The applicant argues in pages 13-14 for claims 8-9 and 22-23 that it is not

obvious to combine Smith and Wallschlaeger.

The examiner respectfully submits that Wallschalaeger clearly disclose a

computer topography apparatus (abstract) wherein this device includes a device

for interpolating captured data for image reconstruction. Smith clearly discloses a

method for computing a natural logarithm function. Therefore, Smith in view of

Wallschalaeger, it would have been obvious application to use the method of

interpolation in Smith's invention into computer topography apparatus to

interpolate the capture data for image reconstruction.

In addition, the applicant has repeatedly cited the claimed language in the

argument without specifically point-out the key arguments. The applicant needs

to point-out the different between the submitted prior art and the present

invention.

In general, in response to applicant's argument that there is no suggestion to

combine the references, the examiner recognizes that obviousness can only be established

by combining or modifying the teachings of the prior art to produce the claimed invention

where there is some teaching, suggestion, or motivation to do so found either in the

references themselves or in the knowledge generally available to one of ordinary skill in

the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*,

958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Conclusion

12.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing

date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The

examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone numbers for the

organization where this application or proceeding is assigned are (703) 746-7239 for regular

communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

Chat C. Do
Examiner
Art Unit 2124

June 11, 2003

CHUONG DINH NGO
PRIMARY EXAMINER